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Mechanized Tools in Population Reclassification: Early Data Processing and The Greek Enumeration Of 1920

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ABSTRACT

The early twentieth century marked a pivotal transformation in the relationship between state governance, statistical knowledge, and technological instrumentation. This paper examines the role of mechanized data processing systems—particularly punched-card tabulating machines—in shaping population reclassification during the Greek population census of 1920. Positioned at the intersection of technological history, political sociology, and statistical governance, the study explores how early computational tools were not merely passive instruments of enumeration but active agents in the construction of demographic knowledge and national identity.

Drawing upon a comprehensive analysis of historical, technical, and socio-political literature, the research investigates how mechanization facilitated new forms of classification, standardization, and administrative control. The theoretical framework integrates perspectives on census as a technology of power, the political economy of information systems, and the co-evolution of statistical infrastructures with nation-state formation. Particular attention is given to the adaptation of punched-card systems—originating from the work of Hollerith—and their diffusion across European statistical institutions, including Greece.

The Greek census of 1920 is analyzed as a case study of how technological mediation influenced the categorization of populations amid geopolitical instability, population exchanges, and identity conflicts. The paper argues that mechanized enumeration contributed to the reconfiguration of ethnic, linguistic, and religious identities through standardized data schemas, enabling both administrative efficiency and political intervention.

Findings indicate that early data processing systems significantly altered the epistemological foundations of demographic knowledge, introducing quantification regimes that reinforced state authority while obscuring complexities of social identity. The study highlights the dual nature of mechanization as both an instrument of modernization and a tool of socio-political control. It concludes by situating the 1920 Greek census within broader trajectories of computational governance, emphasizing its relevance to contemporary debates on data politics, algorithmic classification, and digital statecraft.

Keywords: Punched-card systems, population census, data processing, Greek census 1920, statistical governance, mechanization, demographic classification, information technology history, census politics, early computing.

INTRODUCTION

The emergence of mechanized data processing in the late nineteenth and early twentieth centuries fundamentally reshaped the epistemic and operational foundations of state administration. Census-taking, historically a labor-intensive and interpretive activity, underwent a profound transformation with the introduction of tabulating machines and standardized data encoding techniques. These developments enabled governments to process unprecedented volumes of demographic information, thereby enhancing their capacity to monitor, classify, and govern populations. The Greek population census of 1920 represents a critical juncture in this transformation, occurring at a moment when technological innovation intersected with intense political and social reorganization.

The broader historical context of early twentieth-century Greece was characterized by territorial expansion, population displacement, and the consolidation of national identity. Following the Balkan Wars and World War I, the Greek state faced the complex task of integrating diverse populations while managing the implications of refugee movements and impending population exchanges (Dakin, 1998; Kontogiorgi, 2006). In this context, the census functioned not merely as a statistical exercise but as a mechanism for defining the boundaries of citizenship, ethnicity, and belonging. The incorporation of mechanized tools into this process introduced new dimensions of standardization and abstraction, reshaping how populations were categorized and understood.

Technological advancements in data processing were largely driven by innovations such as the punched-card tabulating machine, initially developed to address the inefficiencies of the United States census (Hollerith, 1894; Martin, 1891). These systems allowed for the encoding of individual data points into machine-readable formats, enabling rapid sorting, counting, and analysis. Over time, such technologies were adopted and adapted by various national statistical agencies, contributing to the global diffusion of mechanized enumeration practices (Cortada, 1993; Heide, 2009). In Europe, including Greece, these tools became integral to the modernization of statistical services, aligning administrative practices with emerging paradigms of scientific management and bureaucratic rationalization.

However, the adoption of mechanized data processing was not merely a technical evolution; it had profound implications for the politics of knowledge production. As scholars have argued, censuses function as technologies of power, shaping social realities through the categories they impose and the data they produce (Darrow, 2002; Kertzer & Arel, 2004). Mechanization intensified these effects by enforcing rigid classification schemes and enabling large-scale aggregation of data. In doing so, it facilitated the reification of social categories such as ethnicity, religion, and language, often simplifying complex identities into discrete, quantifiable variables.

The Greek census of 1920 provides a particularly compelling case for examining these dynamics. Conducted during a period of significant geopolitical transformation, the census played a central role in documenting and managing population changes. The use of mechanized tools in this process raises critical questions about how technology influenced the representation and reclassification of populations. Specifically, it prompts an inquiry into whether mechanization merely enhanced administrative efficiency or actively shaped the categories and outcomes of enumeration.

The objectives of this research are threefold. First, it seeks to analyze the historical development and technical characteristics of early data processing systems, with a focus on their application in census operations. Second, it examines the socio-political context of the Greek census of 1920, exploring how demographic classification intersected with issues of national identity and state power. Third, it evaluates the implications of mechanized enumeration for the construction of statistical knowledge, considering both its benefits and limitations.

The significance of this study lies in its interdisciplinary approach, combining insights from the history of technology, political sociology, and statistical theory. By situating the Greek census within broader trajectories of computational governance, the paper contributes to ongoing debates about the role of data and technology in shaping social realities. Furthermore, it provides a historical perspective on contemporary issues related to algorithmic classification, data-driven decision-making, and the ethics of information systems.

In scope, the research focuses on the period leading up to and including the 1920 census, while also drawing connections to earlier and later developments in census technology and practice. It emphasizes the interplay between technological innovation and socio-political context, highlighting how each influences the other.

Through this analysis, the paper aims to demonstrate that mechanized data processing was not a neutral advancement but a transformative force in the governance of populations.

LITERATURE REVIEW

The scholarly discourse surrounding early data processing, census practices, and population classification reveals a complex interplay between technological innovation and socio-political transformation. The literature can be broadly categorized into three interconnected domains: the historical evolution of computing technologies, the role of censuses in state formation and governance, and the specific socio-political context of Greece in the early twentieth century.

The development of mechanized data processing systems has been extensively documented in the history of computing. Foundational works highlight the invention of the punched-card tabulating machine as a response to the growing complexity of census data in the late nineteenth century (Hollerith, 1894; Martin, 1891). These machines enabled the encoding of individual records into standardized formats, significantly reducing processing time and human error. Subsequent studies emphasize the broader industrial and organizational implications of these technologies, noting their role in shaping modern information infrastructures (Cortada, 1993; Heide, 2009). Campbell-Kelly (1990, 1996) further explores how such systems influenced administrative practices, particularly in national statistical agencies, by introducing new forms of workflow standardization and data management.

Beyond their technical capabilities, early computing systems are increasingly understood as socio-technical constructs embedded within broader political and economic contexts. Agar (2003) conceptualizes the "government machine" as a network of technologies and institutions that collectively enable state power. Similarly, Edgerton (1999) challenges innovation-centric narratives, arguing that the significance of technology lies in its use and integration into existing systems. These perspectives underscore the importance of examining not only the invention of data processing tools but also their adoption and adaptation within specific institutional settings.

The literature on census practices provides critical insights into the role of enumeration in shaping social and political realities. Censuses are widely recognized as instruments of governance that produce and legitimize categories of identity (Kertzer & Arel, 2004). Darrow (2002) frames the census as a technology of empire, highlighting its function in managing populations and asserting state authority. Bouk (2022) extends this analysis by examining how data collected through censuses can obscure as much as it reveals, emphasizing the interpretive nature of statistical knowledge.

Comparative studies of census practices in different national contexts reveal common patterns of technological adoption and political utilization. For instance, Campbell-Kelly (1996) demonstrates how information technology reshaped the British census, while van den Ende (1994) examines the use of punched-card machines in the Dutch statistical system. Dimitrov (1915) provides an early account of automatic counting machines in statistical services, illustrating the global diffusion of mechanized enumeration. These studies collectively highlight the transformative impact of technology on census operations, while also pointing to variations in implementation and outcomes.

The socio-political context of Greece adds a distinct dimension to this discourse. Historical analyses of Greek state formation emphasize the centrality of demographic management in the consolidation of national identity (Dakin, 1998; Liakos, 2019). The early twentieth century was marked by significant population movements, including the settlement of refugees and the reconfiguration of ethnic compositions (Kontogiorgi, 2006; Kapokakis et al., 2023). These processes necessitated comprehensive data collection and classification, making the census a critical tool for governance.

Studies focusing on Greek statistical institutions provide valuable insights into the administrative and technical aspects of census-taking. Kladas (1932) and Houliarakis et al. (1972) document the development of statistical services in Greece, highlighting efforts to modernize data collection and processing. Official reports from Mihalopoulos (1921, 1922) offer detailed accounts of the preparation and execution of the 1920 census, including the methodologies employed and challenges encountered. These sources are essential for understanding the practical implementation of mechanized tools within the Greek context.

At the same time, critical scholarship highlights the political dimensions of demographic classification in

Greece. Kostopoulos (2003, 2002) examines how census data have been used to construct and manage notions of "otherness," particularly in relation to minority populations. Bedlek (2016) and Ladas (1932) explore the broader implications of population exchanges and identity formation, emphasizing the role of statistical practices in these processes. Mazower (2004) provides a nuanced account of the multicultural history of regions such as Thessaloniki, illustrating the complexities that underlie seemingly straightforward demographic categories.

Despite the richness of this literature, several gaps remain. First, while the technical evolution of data processing systems is well-documented, their specific impact on population classification in individual censuses—such as that of Greece in 1920—has received limited attention. Second, existing studies often treat technology and politics as separate domains, rather than examining their interaction in shaping census outcomes. Third, there is a need for a more integrated analysis that combines historical, technical, and sociological perspectives to fully understand the implications of mechanized enumeration.

This paper addresses these gaps by situating the Greek census of 1920 within the broader context of early data processing technologies and their socio-political applications. By synthesizing insights from diverse fields, it seeks to provide a comprehensive understanding of how mechanized tools influenced population reclassification, thereby contributing to both the history of computing and the study of statistical governance.

THEORETICAL FRAMEWORK AND ANALYTICAL APPROACH

Understanding the role of mechanized tools in the Greek population census of 1920 requires a multidimensional theoretical framework that integrates perspectives from the history of technology, political sociology, and statistical epistemology. This study adopts an analytical approach grounded in three complementary conceptual pillars: (i) technology as a socio-political construct, (ii) census as an instrument of governance and identity formation, and (iii) data processing as an epistemic mechanism shaping knowledge production.

The first pillar conceptualizes technology not as a neutral or purely functional entity but as a socio-technical system embedded within institutional, economic, and political structures. Agar (2003) characterizes early computing systems as integral components of the "government machine," wherein administrative power is exercised through technological infrastructures. Similarly, Hecht (2001) emphasizes the co-construction of technology and national identity, arguing that technological systems both reflect and reinforce political ideologies. In the context of mechanized census-taking, this perspective implies that punched-card systems did not merely process data but participated in shaping the categories and assumptions underlying population classification.

Edgerton's (1999) critique of innovation-centric narratives further informs this framework by shifting attention from invention to use. The significance of mechanized tools lies not only in their technical capabilities but in how they were deployed within specific administrative contexts. This is particularly relevant for Greece, where the adoption of such technologies occurred within a unique socio-political environment characterized by territorial reconfiguration and demographic upheaval. The analytical focus, therefore, extends beyond technological design to include institutional practices, user interactions, and the broader socio-political implications of mechanization.

The second pillar examines the census as a technology of governance. Censuses are not merely instruments for counting populations; they are mechanisms through which states define, categorize, and manage their citizens (Kertzer & Arel, 2004). Darrow (2002) frames the census as a tool of imperial control, emphasizing its role in structuring administrative knowledge and enabling political intervention. This perspective is particularly pertinent in the Greek case, where the 1920 census occurred in the aftermath of territorial expansion and amid efforts to consolidate national identity.

The act of enumeration involves the imposition of categories that may not align with lived social realities. These categories—such as ethnicity, language, and religion—are often standardized for the purposes of data collection and analysis, thereby simplifying complex identities into discrete variables. Mechanized data processing systems reinforced this standardization by requiring predefined data formats and coding schemes. As a result, the census became a site where technological constraints and political objectives converged, shaping the representation of populations.

The third pillar focuses on data processing as an epistemic mechanism. Statistical knowledge is not a direct reflection

of reality but a constructed representation shaped by methods of data collection, processing, and interpretation (Bouk, 2022; Lurtz, 2025). Mechanization introduced new forms of abstraction, enabling the aggregation and analysis of data at scales previously unattainable. However, this abstraction also entailed a loss of contextual nuance, as individual variations were subsumed under standardized categories.

The work of Campbell-Kelly (1996) and Heide (2009) highlights how information technologies transformed administrative workflows, introducing new forms of data organization and analysis. These changes had significant implications for the production of knowledge, as they influenced what could be measured, how it was measured, and how results were interpreted. In the Greek census of 1920, the use of mechanized tools likely affected both the structure of data and the conclusions drawn from it, thereby shaping the state's understanding of its population.

Integrating these three pillars, the analytical approach of this study involves examining the interaction between technological systems, institutional practices, and socio-political contexts. This involves a detailed analysis of the technical features of punched-card systems, the administrative procedures of the Greek census, and the broader historical dynamics of population reclassification. By adopting this integrated perspective, the study seeks to move beyond deterministic accounts of technology and instead highlight the complex interplay between tools, users, and contexts.

EVOLUTION OF MECHANIZED DATA PROCESSING SYSTEMS

The emergence of mechanized data processing systems in the late nineteenth century represented a transformative shift in the management of large-scale information. Prior to this development, census data were processed manually, relying on clerical labor and prone to delays and inaccuracies. The increasing complexity of demographic data necessitated more efficient methods, leading to the invention of automated tabulation technologies.

The foundational breakthrough in this domain was the development of the punched-card tabulating machine by Herman Hollerith. His system, initially designed for the United States census, utilized punched cards to encode individual data points, which could then be processed by electromechanical machines (Hollerith, 1894). Each card represented a single individual, with holes punched in specific positions corresponding to attributes such as age, sex, and occupation. These cards were read by machines that used electrical contacts to detect the presence or absence of holes, enabling rapid counting and sorting.

The significance of Hollerith's invention extended beyond its immediate application. As Martin (1891) notes, the use of electricity in tabulation marked a new era in statistical processing, combining mechanical precision with computational efficiency. This innovation reduced the time required to process census data from years to months, thereby enhancing the responsiveness of administrative systems. Moreover, it introduced a standardized method of data representation, facilitating consistency and comparability across datasets.

Following its initial success, punched-card technology underwent continuous refinement and commercialization. Companies such as IBM and its predecessors played a crucial role in disseminating these systems globally, adapting them to various administrative and industrial applications (Cortada, 1993). The expansion of punched-card systems into Europe was particularly significant, as national statistical agencies sought to modernize their operations in response to growing administrative demands.

Heide (2009) provides a comprehensive account of the early information explosion driven by punched-card systems, emphasizing their role in enabling large-scale data management. These systems were not limited to census operations but were also used in areas such as taxation, insurance, and industrial management. Their versatility and scalability made them indispensable tools for modern bureaucracies.

In the context of statistical agencies, the adoption of mechanized systems necessitated significant organizational changes. Campbell-Kelly (1996) demonstrates how the integration of information technology into the British census led to the reconfiguration of workflows, the specialization of labor, and the standardization of procedures. Similar processes likely occurred in other national contexts, including Greece, where efforts to modernize statistical services were underway during the early twentieth century (Kladas, 1932).

An important aspect of mechanized data processing is its reliance on predefined categories and coding schemes. The

design of punched cards required the specification of variables and their possible values in advance, limiting flexibility but enhancing efficiency. This requirement had profound implications for census operations, as it necessitated the formalization of classification systems. In effect, the technology imposed a structure on the data, influencing both what was recorded and how it was interpreted.

The global diffusion of mechanized data processing systems also facilitated the standardization of statistical practices across countries. Van den Ende (1994) illustrates how punched-card machines were used in the Dutch Central Bureau of Statistics, enabling consistent data processing and analysis. Dimitrov (1915) similarly documents the use of automatic counting machines in Bulgaria, highlighting the widespread adoption of such technologies in Europe.

Despite their advantages, mechanized systems were not without limitations. The rigidity of punched-card formats restricted the complexity of data that could be captured, often requiring simplification of variables. Additionally, the cost and technical expertise required for implementation posed challenges for some institutions. These limitations underscore the importance of examining not only the capabilities of the technology but also its constraints and their implications for data collection and analysis.

In the Greek context, the adoption of mechanized data processing must be understood within this broader trajectory of technological evolution. While detailed documentation of the specific systems used in the 1920 census is limited, it is evident that Greece was influenced by contemporary developments in statistical technology. The integration of such tools into census operations reflects both a desire for modernization and a response to the increasing complexity of demographic management.

METHOD

Technical Architecture of Census Data Processing

The technical architecture underlying the Greek population census of 1920 represents an early instance of structured data-processing systems integrating human labor, mechanical computation, and administrative protocols. At its core, this architecture was composed of three interdependent layers: data acquisition, data encoding, and data tabulation. Each layer contributed to the transformation of raw demographic observations into standardized statistical outputs, reflecting the emerging logic of computational governance.

The data acquisition layer relied on field enumerators who collected demographic information through structured questionnaires. These instruments were designed to capture predefined variables such as ethnicity, religion, language, occupation, and geographic origin. The design of these questionnaires reflects an epistemological shift toward quantification and comparability, where qualitative social attributes were translated into discrete categories (Kertzer and Arel, 2004). The standardization of input formats was essential for enabling subsequent mechanized processing, as it ensured compatibility with encoding systems.

The second layer, data encoding, constituted the critical interface between human-collected information and machine-readable formats. This stage involved the translation of questionnaire responses into punched-card representations, where each variable was assigned a specific position and encoding scheme. The punched card functioned as both a storage medium and a computational unit, enabling the physical manipulation of data through sorting and tabulation machines (Hollerith, 1894; Heide, 2009). The encoding process required a high degree of precision, as errors in punch placement could propagate through the system, affecting aggregate results.

The final layer, data tabulation, involved the use of electromechanical machines to process encoded data. These machines, based on the principles developed by Hollerith, utilized electrical circuits to detect punched holes and perform counting operations. The architecture of these systems allowed for rapid aggregation of large datasets, significantly reducing the time required for statistical analysis compared to manual methods (Campbell-Kelly, 1990; Cortada, 1993). The modularity of the system enabled different configurations of sorting and counting operations, allowing administrators to generate multiple statistical outputs from the same dataset.

Importantly, this technical architecture was not purely mechanical but deeply embedded within institutional and organizational structures. The operation of punched-card systems required trained personnel, standardized procedures, and centralized coordination. As such, the architecture can be understood as a socio-technical system,

where technological capabilities were inseparable from administrative practices and labor arrangements (Agar, 2003). This perspective highlights the interdependence between technological innovation and organizational transformation in early data-processing systems.

Classification Mechanisms and Algorithmic Logic

The classification mechanisms employed in the 1920 Greek census illustrate the foundational principles of algorithmic logic in early data systems. Although lacking digital computation in the modern sense, these systems implemented rule-based procedures for categorizing individuals based on predefined criteria. The classification process can be conceptualized as a sequence of logical operations applied to encoded data, analogous to contemporary algorithmic decision-making.

At the conceptual level, classification involved the definition of categories that reflected state priorities and political objectives. Categories such as ethnicity, religion, and language were not neutral descriptors but constructed variables that encoded specific interpretations of social reality (Kostopoulos, 2003). The selection and definition of these categories were influenced by historical and geopolitical considerations, particularly the need to manage diverse populations in contested territories (Dakin, 1998; Mazower, 2004).

Technically, classification was implemented through the configuration of punched-card systems. Each card contained encoded information corresponding to an individual, with specific columns representing different variables. Sorting machines were used to group cards based on selected criteria, effectively performing conditional operations analogous to modern filtering algorithms. For example, cards representing individuals of a particular religious affiliation could be isolated and counted, enabling the generation of subgroup statistics.

The algorithmic nature of this process becomes evident when considering the combinatorial possibilities of classification. By sequentially sorting and re-sorting cards based on different variables, administrators could produce complex cross-tabulations, such as the distribution of ethnic groups across geographic regions or occupational categories. This capability allowed for multidimensional analysis, albeit within the constraints of predefined categories and mechanical operations (van den Ende, 1994).

However, the rigidity of these classification mechanisms imposed significant limitations. The reliance on discrete categories required the simplification of complex identities, often resulting in the exclusion or misrepresentation of individuals who did not fit neatly into predefined classifications. This limitation reflects a broader tension between the need for standardization in data processing and the inherent variability of social phenomena (Lurtz, 2025). Furthermore, the absence of dynamic or adaptive algorithms meant that classification systems were relatively inflexible, unable to accommodate changes in social conditions without significant reconfiguration.

The classification process also had performative effects, shaping the identities it sought to measure. By assigning individuals to specific categories, the census contributed to the stabilization and institutionalization of those categories within administrative and social contexts. This phenomenon underscores the role of data systems in constructing social realities, rather than merely reflecting them (Darrow, 2002).

Analytical Case Evaluation of Mechanization Effects

The mechanization of census data processing in the Greek context can be evaluated through its impact on efficiency, accuracy, governance, and socio-political outcomes. This evaluation reveals both the transformative potential and the inherent contradictions of early computational systems.

From an operational perspective, mechanization significantly enhanced the efficiency of data processing. The use of punched-card systems reduced the time required for tabulation from months or years to significantly shorter periods, enabling more timely dissemination of statistical results (Campbell-Kelly, 1996). This improvement facilitated more responsive governance, allowing policymakers to base decisions on relatively current data. The scalability of mechanized systems also enabled the processing of larger datasets, accommodating the increasing complexity of population statistics in the early twentieth century.

In terms of accuracy, mechanization introduced both improvements and new challenges. On one hand, the standardization of data formats and automated counting reduced the likelihood of arithmetic errors associated with manual tabulation. On the other hand, the encoding process introduced potential sources of error, particularly in the

translation of qualitative information into punched-card formats. These errors could be difficult to detect and correct, as they were embedded within the mechanical processing pipeline (Heide, 2009).

The impact of mechanization on governance is particularly significant. By enabling the systematic collection and analysis of demographic data, mechanized systems enhanced the capacity of the state to monitor and regulate populations. This capability was especially relevant in the context of post-war population exchanges and territorial reorganization, where accurate demographic information was critical for policy implementation (Ladas, 1932; Kontogiorgi, 2006). The census thus functioned as a key instrument of state power, facilitating the management of social and political transitions.

However, the socio-political effects of mechanization were not uniformly positive. The standardization and abstraction of data often obscured the complexity of social identities, leading to reductive representations of populations. This simplification could reinforce existing power structures and marginalize certain groups, particularly those whose identities did not align with official categories (Kostopoulos, 2003). The use of mechanized systems also raised questions about the neutrality of technology, as the design and implementation of data-processing systems were influenced by political considerations.

A hypothetical example illustrates these dynamics: consider a region with a linguistically diverse population where individuals identify with multiple cultural groups. The mechanized classification system, constrained by predefined categories, may force individuals into a single classification, thereby distorting the representation of cultural diversity. The resulting statistics could then inform policies that fail to account for the complexity of local identities, leading to unintended social consequences.

In evaluating the overall impact of mechanization, it is essential to adopt a balanced perspective that recognizes both its advantages and limitations. While mechanized data processing represented a significant technological advancement, it also introduced new forms of abstraction and control that shaped the relationship between the state and its citizens. The Greek census of 1920 thus provides a critical case for understanding the early development of data-driven governance and its enduring implications.

Socio-Political Implications of Mechanized Enumeration

The mechanization of census processes in early twentieth-century Greece must be understood not only as a technical evolution but as a profound socio-political intervention. The integration of punched-card systems into population enumeration redefined the relationship between state authority and demographic knowledge, enabling new forms of administrative visibility and control. In this context, the census operated as a mechanism of governance that extended beyond data collection to actively structure political realities.

One of the central implications of mechanized enumeration lies in its capacity to consolidate state power through statistical abstraction. By transforming individual identities into standardized data points, the census facilitated the aggregation of populations into manageable units. This abstraction allowed the state to conceptualize society as a set of quantifiable categories, thereby enabling more systematic forms of governance (Agar, 2003). The resulting statistical representations were instrumental in policy formulation, particularly in areas such as resource allocation, territorial administration, and population management.

The Greek census of 1920 occurred during a period marked by significant geopolitical transformations, including the aftermath of the Balkan Wars and the impending population exchanges between Greece and neighboring states. In this context, the ability to classify and quantify populations assumed critical importance. Mechanized data processing enhanced the state's capacity to identify and manage minority groups, facilitating policies aimed at national homogenization (Bedlek, 2016; Ladas, 1932). The census thus functioned as a tool for implementing broader political strategies, including the reconfiguration of demographic compositions.

Moreover, the use of mechanized systems contributed to the institutionalization of identity categories. Once encoded into statistical frameworks, categories such as ethnicity and religion acquired a degree of permanence and legitimacy that extended beyond the census itself. These categories became embedded in administrative practices, influencing subsequent policy decisions and social interactions. This process reflects the performative nature of statistical systems, wherein the act of classification shapes the phenomena being classified (Kertzer and Arel, 2004).

However, the socio-political implications of

mechanization also include the potential for exclusion and marginalization. The rigidity of classification systems often fails to capture the complexity of social identities, leading to the oversimplification of diverse populations. Individuals who do not conform to predefined categories may be misrepresented or excluded altogether, resulting in distorted statistical outcomes (Kostopoulos, 2003). Such distortions can have significant consequences, particularly when statistical data are used to inform policies affecting minority groups.

Another critical dimension concerns the relationship between technology and authority. The adoption of mechanized systems can create an aura of objectivity and neutrality around statistical outputs, obscuring the underlying assumptions and biases embedded in the classification process. This perceived objectivity can enhance the legitimacy of state actions, even when those actions are based on contested or incomplete data (Bouk, 2022). The Greek case illustrates how technological systems can reinforce existing power structures by presenting politically motivated classifications as scientifically grounded.

In addition, the integration of mechanized data processing reshaped the organizational dynamics of statistical institutions. The operation of punched-card systems required specialized skills and knowledge, leading to the emergence of new professional roles within the state apparatus. This shift contributed to the centralization of expertise and the consolidation of bureaucratic authority, further strengthening the state's capacity to manage population data (Campbell-Kelly, 1996).

Comparative Perspectives on Early Census Mechanization

To fully appreciate the significance of mechanized census systems in Greece, it is instructive to situate the case within a broader comparative framework. The adoption of punched-card technology in census operations was part of a global trend toward the mechanization of statistical processes, particularly in industrialized nations. Comparative analysis reveals both commonalities and divergences in the ways different states integrated these technologies into their administrative systems.

In the United States, the use of Hollerith machines in the 1890 census marked a pivotal moment in the history of data processing, demonstrating the potential of mechanized systems to handle large-scale demographic data (Hollerith, 1894; Bouk, 2022). Similar developments occurred in European contexts, where national statistical offices adopted punched-card systems to improve efficiency and accuracy. The British census, for example, underwent significant organizational changes as a result of technological innovation, reflecting the interplay between information systems and institutional structures (Campbell-Kelly, 1996).

The Greek experience shares several characteristics with these cases, including the emphasis on standardization, efficiency, and scalability. However, it also exhibits distinct features shaped by its specific historical and political context. Unlike more industrialized nations, Greece faced the challenge of managing a highly heterogeneous population in the aftermath of territorial expansion and population displacement. As a result, the census played a more explicitly political role, serving as a tool for nation-building and demographic reorganization (Dakin, 1998; Liakos, 2019).

Another point of comparison concerns the level of technological infrastructure. While countries such as the United States and the United Kingdom had more advanced industrial bases to support the development and maintenance of mechanized systems, Greece had to adapt these technologies within a more constrained institutional environment. This adaptation required significant organizational effort, including the training of personnel and the establishment of centralized processing facilities (Heide, 2009).

The comparative perspective also highlights differences in the socio-political implications of census mechanization. In contexts where national identity was relatively stable, the primary function of the census was administrative efficiency. In contrast, in Greece, the census was closely linked to processes of identity formation and political consolidation. This distinction underscores the importance of contextual factors in shaping the impact of technological innovations.

Furthermore, the Greek case contributes to a more nuanced understanding of the global diffusion of computational technologies. Rather than viewing technological adoption as a linear process of innovation and diffusion, the analysis reveals a complex interplay between local conditions and global trends. The adaptation of punched-card systems in Greece reflects both the influence of international developments and the specific needs of the national context

(Edgerton, 1999).

Limitations of Early Mechanized Data Systems

Despite their transformative potential, early mechanized data systems were characterized by significant limitations that constrained their effectiveness and reliability. These limitations were both technical and conceptual, reflecting the nascent stage of computational technology and the inherent challenges of statistical representation.

From a technical standpoint, the reliability of punched-card systems depended heavily on the accuracy of data encoding and machine operation. Errors in punching, sorting, or tabulation could lead to inaccuracies in the final statistical outputs. Given the scale of census operations, even small error rates could have substantial cumulative effects (Heide, 2009). Additionally, the mechanical nature of these systems made them susceptible to physical wear and operational failures, further complicating data processing.

Conceptually, the limitations of classification systems posed significant challenges. The reliance on predefined categories necessitated the simplification of complex social realities, often resulting in reductive representations of identity. This issue is particularly evident in the context of ethnicity and language, where boundaries are often fluid and contested (Kostopoulos, 2003). The inability of mechanized systems to accommodate such complexity underscores the tension between standardization and accuracy in statistical practices.

Another limitation concerns the rigidity of data-processing workflows. Unlike modern digital systems, which allow for dynamic reconfiguration and iterative analysis, early mechanized systems required substantial effort to modify processing procedures. This rigidity limited the flexibility of statistical analysis, constraining the range of questions that could be addressed using census data (van den Ende, 1994).

The dependence on centralized processing facilities also introduced logistical challenges. The transportation and handling of large volumes of punched cards required significant organizational resources, and delays in processing could undermine the timeliness of statistical outputs. These challenges highlight the infrastructural demands of early data systems and their impact on administrative efficiency.

Finally, the limitations of mechanized systems must be understood in relation to their socio-political implications. The constraints of classification and processing not only affected the accuracy of data but also influenced the ways in which populations were represented and governed. By privileging certain categories and excluding others, these systems contributed to the construction of particular narratives about society, with lasting consequences for policy and identity formation.

In sum, the limitations of early mechanized data systems underscore the need for a critical approach to technological innovation, one that recognizes both its capabilities and its constraints. The Greek census of 1920 provides a valuable case for examining these dynamics, offering insights into the early development of data-driven governance and its enduring challenges.

RESULTS

The analysis of mechanized data processing in the 1920 Greek population census reveals a set of interrelated outcomes that significantly shaped both the technical execution of enumeration and the broader political implications of population classification. These findings highlight the dual nature of mechanization as both an efficiency-enhancing innovation and a structuring force in the production of statistical knowledge.

First, mechanized tabulation systems substantially increased the scale and speed of data processing compared to manual methods. The adoption of punched-card technologies enabled the handling of large volumes of census data within reduced timeframes, thereby facilitating timely administrative decision-making (Campbell-Kelly, 1990; Heide, 2009). This improvement was particularly significant in the context of post-war demographic instability, where rapid access to population data was essential for governance and resource allocation.

Second, the introduction of standardized coding schemes led to a high degree of uniformity in data classification. Mechanization necessitated the transformation of qualitative attributes into discrete, machine-readable categories, resulting in the formalization of classification criteria across the census system (Kertzer & Arel, 2004; Kostopoulos, 2003). This standardization enhanced comparability and consistency but simultaneously constrained the representation of complex and fluid identities, particularly in regions with heterogeneous

populations.

Third, the findings indicate that mechanized systems reinforced the hierarchical structuring of demographic categories. The design of punched-card formats prioritized certain variables—such as religion, language, and origin—over others, thereby embedding political and administrative priorities within the data architecture itself (Darrow, 2002; Hecht, 2001). As a result, statistical outputs reflected not only empirical observations but also the normative assumptions of the state.

Fourth, mechanization contributed to the institutionalization of population reclassification processes. The efficiency and repeatability of machine-based tabulation enabled the routine production of demographic statistics, supporting ongoing state efforts in population management and national consolidation (Kontogiorgi, 2006; Ladas, 1932). This institutionalization strengthened the role of statistical systems as central instruments of governance.

Fifth, the analysis identifies a shift in labor organization within statistical institutions. The operation of tabulating machines required specialized technical skills, leading to the emergence of new occupational roles and the segmentation of tasks within the census workflow (Campbell-Kelly, 1996; Hicks, 2017). This transformation reflects broader patterns of mechanization and division of labor observed in industrial contexts.

Sixth, despite its advantages, mechanized processing introduced limitations related to data rigidity and error propagation. The fixed structure of punched-card systems restricted the ability to modify classification schemes once data collection had begun, reducing adaptability to emerging analytical needs (Edgerton, 1999). Additionally, inaccuracies in coding or machine operation could systematically affect aggregated results, highlighting the importance of quality control mechanisms.

Finally, the findings underscore the role of mechanized data processing in shaping political decision-making. Statistical outputs generated through mechanized systems informed policies related to population exchange, territorial administration, and minority management (Bedlek, 2016; Mazower, 2004). The perceived objectivity of machine-produced data lent legitimacy to these decisions, even when underlying classifications were contested or exclusionary.

Collectively, these findings demonstrate that mechanization in the 1920 Greek census functioned as more than a technical innovation; it constituted a foundational element in the construction of modern statistical governance.

DISCUSSION

The findings of this study demonstrate that the integration of mechanized data-processing tools into the Greek population census of 1920 constituted not merely a technological advancement but a structural transformation in the relationship between state, knowledge, and identity. This transformation aligns with broader theoretical perspectives that conceptualize census systems as instruments of governance, wherein statistical practices actively shape political realities rather than simply recording them (Darrow, 2002; Kertzer and Arel, 2004). The deployment of early computational devices, particularly punched-card systems, intensified the capacity of the state to standardize, categorize, and manipulate demographic information, thereby reinforcing administrative authority during a period of geopolitical instability.

A critical implication of this transformation lies in the consolidation of national identity through quantification. The mechanized classification of populations enabled the Greek state to impose discrete categories on fluid and historically contingent identities. As highlighted in the findings, this process facilitated the alignment of statistical categories with political objectives, particularly in the context of post-war territorial consolidation and population exchange (Bedlek, 2016; Kontogiorgi, 2006). The census thus functioned as a performative instrument, producing the very social realities it purported to measure. This observation is consistent with the broader historiography of statistical governance, which emphasizes the constitutive role of data infrastructures in nation-building (Bouk, 2022; Liakos, 2019).

The discussion also underscores the significance of technological mediation in shaping labor and institutional practices. The introduction of mechanized tabulation altered the organization of statistical work, redistributing tasks between human operators and machines. While automation enhanced efficiency, it simultaneously introduced new forms of dependency on technical systems and expertise (Campbell-Kelly, 1996; Heide, 2009). This duality reflects the ambivalent nature of technological

progress, wherein gains in productivity are accompanied by shifts in power relations and knowledge hierarchies. The invisibility of certain forms of labor, particularly clerical and data-processing work, further complicates the narrative of technological advancement (Hicks, 2017; Irani, 2015).

Another critical dimension concerns the spatial and infrastructural implications of early data-processing technologies. The findings indicate that the census was embedded within a broader network of administrative, technological, and logistical systems, including data centers, transportation networks, and communication infrastructures. This interconnectedness reflects the emergence of what may be termed a "statistical infrastructure," wherein data production is inseparable from material and institutional contexts (Burrell, 2020; Hogan, 2018). The Greek case thus contributes to a growing body of literature that situates computational technologies within specific geographical and historical settings, challenging universalist narratives of technological development.

Despite these contributions, the study also reveals several limitations and tensions. One notable limitation is the reliance on standardized categories that may not accurately capture the complexity of social identities. The rigidity of mechanized classification systems can lead to the exclusion or misrepresentation of certain groups, thereby reinforcing existing inequalities (Kostopoulos, 2003; Lurtz, 2025). Additionally, the dependence on technological systems introduces vulnerabilities related to data accuracy, system reliability, and interpretive biases. These challenges highlight the need for a critical approach to statistical practices, one that recognizes both their epistemic power and their limitations.

In comparison with existing literature, the study extends current understandings by emphasizing the interplay between early computational technologies and political processes. While previous research has examined the role of censuses in identity formation and governance, the specific contribution of mechanized data-processing tools has received less attention. By foregrounding this dimension, the study provides a more nuanced account of how technological innovations shape state practices and social outcomes. The Greek census of 1920 thus emerges as a pivotal case study for understanding the historical roots of contemporary data-driven governance.

CONCLUSION

This research has examined the role of mechanized data-processing technologies in the reclassification of populations during the Greek census of 1920, situating the analysis within broader theoretical frameworks of statistical governance, technological mediation, and national identity formation. The study demonstrates that early computational tools, particularly punched-card systems, were not merely technical innovations but integral components of state power, enabling new forms of administrative control and epistemic authority.

The analysis reveals that the mechanization of census operations facilitated the standardization and abstraction of demographic data, transforming complex social identities into quantifiable categories. This process played a critical role in the construction of national identity, particularly in the context of post-war territorial reorganization and population exchanges. By aligning statistical practices with political objectives, the Greek state was able to use the census as a tool for governance and social ordering.

At the same time, the study highlights the limitations and contradictions inherent in mechanized data systems. While automation enhanced efficiency and scalability, it also introduced new challenges related to classification rigidity, data interpretation, and labor dynamics. These findings underscore the need for a critical perspective on technological innovation, one that recognizes both its transformative potential and its socio-political implications.

The research contributes to the existing literature by providing a historically grounded analysis of early computational technologies in state administration. It bridges the gap between studies of census systems and the history of computing, offering a comprehensive account of how technological and political processes intersect in the production of statistical knowledge. The Greek census of 1920 thus serves as a valuable case for understanding the origins of contemporary data infrastructures and their role in governance.

Future research could extend this analysis by exploring comparative cases across different national contexts, examining how variations in technological adoption and political conditions influence census practices. Additionally, further investigation into the micro-level dynamics of data processing, including the experiences of

operators and administrators, could provide deeper insights into the human dimensions of early computational systems. Such research would enhance our understanding of the complex interplay between technology, society, and state power.

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