The Heckman Equation: Invest + Develop + Sustain = Gain

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American education requires a revolution. The economic-based research of Dr James Heckman proves that the reactive policies enacted by federal and state governments to equalize disparities in income and education are inefficient, futile, and costly. In an increasingly global world, today's workforce calls for highly skilled employees who have proficient cognitive as well as non-cognitive characteristics. Revisiting the classic nature versus nurture argument, Dr Heckman demonstrates that educational policies and programs that focus on reforming the early environments of disadvantaged youths, increases a child's chances at academic, professional, and social success. Current education programs which focus on increasing children's IQ's, or other genetically based cognitive abilities, are missing a significant portion of what attributes for an individual's success. Genetics, while important, are not the final determinations of one's accomplishment. A child's early development of non-cognitive abilities, or "soft skills" like motivation, self-control, and communication, will generate a high return on investment nationwide in areas such as health, safety, and employment. The future of education must focus on fostering the perfect marriage of cognitive ability and personality traits in early childhood to generate social success on both a micro and macro level.

In this paper, I will begin by outlining the strategies, goals, and shortcomings of customary education and work-training policy. I will then detail the divided America that Dr Heckman argues we have the power to unite. Next, I will describe the revolution Dr Heckman requires for academic and vocational success as a nation: the Heckman

Equation. Finally, I will demonstrate the long-term effects the Heckman Equation will yield in society by providing examples such as increased health, decreased crime, and the emergence of equality.

I. HISTORY

Traditionally, the United States has acted as a "second chance" society[1]. Confident in an individual's ability to grow and change, educational and employment policies were designed to target disadvantaged teenagers[2]. Beginning with Johnson's War on Poverty in the 1960's, large-scale programs began to train teenagers for the workforce. The Adult Basic Education Act of 1966 was a War on Poverty program that provided adults with levels of education believed to raise them out of poverty[3]. Seeking to reduce poverty in America by employing adolescents and teaching them vocational tools for success, these programs began around the ages of 17 and 18, and created production-ready citizens. Around this time, there became an expansion in programs that required high school degrees or their equivalents for indigent individuals to receive welfare and social security benefits. These courses became populated with individuals seeking to make ends meet. The resulting economic successes of participants, however, were met with miserable success rates[4]. Performing a cost-benefit analysis that looks to

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[1] James J. Heckman, et. al., *Skill Formation and the Economics of Investing in Disadvantaged Children*, 312 AM. ACAD. OF SCIS.,1901, 1900-1904 (2006).
[2] James J. Heckman, *Why Early Investment Matters,* THE HECKMAN EQUATION,
[2] James J. Heckman, *Why Early Investment Matters,* THE HECKMAN EQUATION, http://www.heckmanequation.org/content/resource/why-early-investment-matters (last visited April 16, 2013).
[3] Stephen V. Cameron & James J. Heckman, *The Nonequivalence of High School Equivalents,* NAT'L. BUREAU OF ECON. RESEARCH, 5, 1-6 (1991).
[4] James J. Heckman, *Why Early Investment Matters,* THE HECKMAN EQUATION, http://www.heckmanequation.org/content/resource/why-early-investment-matters (last visited April 16, 2013).

the money spent training participants against the net profits generated from their performance; the statistics demonstrated a negative return on investment[5]. At issue were not the day-to-day skills propelling participants through the workforce, but the lack of motivation and drive behind these newly gleaned skills retroactively bestowed upon them.

Current methods of retroactive job and education training have also proven inadequate. Comparing traditional high school graduates with those who receive their diplomas through exam certified high school equivalents, Dr Heckman demonstrates that passing one's General Education Development (GED) test is not an analogous replacement for a four-year high school education[6]. Dr Heckman found the economic outcomes of these distinct paths of high school certification to be disparate. While many students or young adults seeking employment are forced to take the GED as a substitute to graduating high school, Dr Heckman has proven that those who obtain their GED earn later incomes that are more comparable to high school dropouts than high school graduates[7]. Further, the labor supply equations ran by Dr Heckman demonstrate that GED recipients have higher unemployment rates than high school dropouts or high school graduates, and that GED recipients are more likely to change jobs and job fields

[5] Heckman, *Reduce Deficits and Strengthen the Economy: Invest in Early Childhood Development,* THE HECKMAN EQUATION, http://www.heckmanequation.org/content/resource/reduce-deficits-and-strengthen-economy-invest-early-childhood-development (last visited April 16, 2013).
[6] Stephen V. Cameron & James J. Heckman, *The Nonequivalence of High School Equivalents,* NAT'L. BUREAU OF ECON. RESEARCH, 5, 1-6 (1991).
[7] *Id*. at 6.

than high school drop outs[8]. It appears that there is no replacement for a conventional classroom.

II. DIVIDED SOCIETY

America's success in the competitive, global market is determined by successfully preparing students today. Dr Heckman posits that we have created a divided society. He calls it the land of "two Americas". Heckman points to America's Gini Coefficient, which is a measurement of distributional inequality in society. Commonly used to gauge income and wealth inequality, a Gini coefficient of zero represents perfect equality, whereas a coefficient of one demonstrates greatest inequality[9]. The Gini coefficient for inequality in America is .46, the same as that of Mexico. Acknowledging the substantial gap between the haves and have-nots, it is clear from a social, economic, and psychological standpoint, that these disparate societies have manifest into their own worlds. The demand for higher skilled laborers has increased rapidly, while the less skilled laborers are left unemployed and impoverished[10]. Roughly 20% of the United States working population is unqualified for the upper levels of the workforce, impeding US competitiveness and further bisecting society[11]. This employment gap stems from the stratified differences in college-attending students, and those not seeking a degree[12]. Dr Heckman has published studies indicating that gaps in college attendance are polarized

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[8] *Id*. at 22.
[9] Data, THE WORLD BANK, http://data.worldbank.org/indicator/SI.POV.GINI (last visited April 16, 2013).
[10] Heckman, *Reduce Deficits and Strengthen the Economy: Invest in Early Childhood Development,* THE HECKMAN EQUATION, http://www.heckmanequation.org/content/resource/reduce-deficits-and-strengthen-economy-invest-early-childhood-development (last visited April 16, 2013).
[11] James J. Heckman & Dimitriy V. Masterov, *The Productivity Argument for Investing in Young Children*, 29 REV. OF AGRI. ECON., 453, 446-493 (2007).
[12] I*d*. at 468.

based on racial and ethnic group classifications[13]. Conventionally, it was believed that the racial and ethnic divide which demonstrated that more whites were attending college and racial minorities like Hispanics and African Americans were based in gaps due to parental income. This conventional understanding, however, is flawed. The gap propelling Caucasian enrollment in colleges and hindering the applications of racial minorities is instead rooted in actual ability differences between the ethnic groups. Money is not the issue. Child preparedness is. Therefore, educational reform at lower levels is required to reduce present employment and economic inequality to raise the productivity of society at large[14].

III. THE REVOLUTION

Dr Heckman's formula for the future of education is simple: Invest + Develop + Sustain = Gain[15]. Through early investment in the lives of disadvantaged young children, targeting home and family settings before they set foot in the classroom, children are given an opportunity to develop essential character traits, like motivation and self-determination. After fostering these soft-skills that are proven to generate academic and occupational success, the children will be able to self-sustain their desire for learning and knowledge by manifesting internal drive to achieve[16]. The final "gain" will be a reduction in the net levels of crime and inequality in America, along with an increase in public health and safety[17]. Dr Heckman calls this method "predistribution" instead of

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[13] James J. Heckman & Dimitriy V. Masterov, *The Productivity Argument for Investing in Young Children*, REV. OF AGRI. ECON., Vol. 29, No. 3, 446-493, 453 (2007).
[14] *Id*. at 446
[15] James J. Heckman, *The Case for Investing In Disadvantaged Young Children*, BIG IDEAS FOR CHILDREN: INVESTING IN OUR NATION'S FUTURE, 49-56, 53 (2012).
[16] *Id*. at 53
[17] *Id*.

"remediation". While later remediation may succeed, its programs are extremely costly. Programs such as reducing the pupil-teacher ratio, public job training, convict rehabilitation programs, and adult literacy programs are far less effective and strain government budgets[18]. He argues that in order to see the social and economic improvements we desire, our focus should be on the prevention of these communal concerns, not the restoration[19].

Ability and understanding gaps are distinguished early in a young child's life[20]. Consequentially, the family environment plays a major role in the future cognitive and socioeconomic abilities developed from the time of birth. The American family, however, is deteriorating. With 25% of children being born to single parents in disadvantaged households, an increasing number of children begin life with higher hurdles to overcome[21]. Dr Heckman notes that the number of words a child is read differs greatly depending on their household dynamic. Further, by age three, the number of words a child knows is directly related to the number of words a child is exposed to by a parent or adult[22]. Thus, the structure of the developing brain is greatly affected by parental investment. Conversely, adverse parenting substantially impairs a child's life-

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[18] *Id*. at 56
[19] Heckman, *The Essential Growth Strategy: Investing in Early Childhood Education,* THE HECKMAN EQUATION, http://www.heckmanequation.org/content/resource/essential-growth-strategy-investing-early-childhood-education (last visited April 16, 2013).
[20] James J. Heckman, *The Case for Investing In Disadvantaged Young Children*, BIG IDEAS FOR CHILDREN: INVESTING IN OUR NATION'S FUTURE, 50, 49-56 (2012).
[21] James J. Heckman & Dimitriy V. Masterov, *The Productivity Argument for Investing in Young Children*, 29 REV. OF AGR. ECON., 446, 446-493 (2007).
[22] Heckman, *Family Matters,* http://www.heckmanequation.org/content/resource/family-matters (last visited April 16, 2013).

long learning abilities[23]. In the Coleman Report, conducted in 1966, the documented inequality in school achievement demonstrates that the predominant factor explaining variation in education performance is the variation in the parent environment[24]. The study found that families, not schools, are the major source of inequality in student performance by proving that by third grade, gaps in testing across socioeconomic groups are already established[25]. While this study is outdated, the findings are increasingly relevant today. It is clear that the Heckman revolution must begin in the home at a very early age.

IV. PSYCHOLOGICAL EVIDENCE

The Marshmallow Test reveals how early in life we develop non-cognitive skills. Led by psychologist Walter Mischel, favored by Dr Heckman, the study tests four to six-year-olds' abilities to delay gratification[26]. Individually, the children participants were taken into a room by a research assistant and placed in front of a single marshmallow[27]. The researcher told them that if they could wait fifteen minutes until the researcher returned, they would receive two marshmallows instead of the one. Twenty years later, Mischel discovered that the children who were able to exercise self-control early and wait to receive the second marshmallow performed better on standardized tests, were more

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[23] James J. Heckman, *The Case for Investing In Disadvantaged Young Children*, BIG IDEAS FOR CHILDREN: INVESTING IN OUR NATION'S FUTURE, 55, 49-56 (2012).
[24] James J. Heckman & Dimitriy V. Masterov, *The Productivity Argument for Investing in Young Children*, 29 REV. OF AGRI. ECON., 447, 446-493 (2007).
[25] James J. Heckman, et. al., *Skill Formation and the Economics of Investing in Disadvantaged Children*, 312 AM. ACAD. OF SCIS., 1901, 1900-1904 (2006).
[26] Heckman, *The Hard Facts Behind Soft Skills,* THE HECKMAN EQUATION, http://www.heckmanequation.org/content/resource/hard-facts-behind-soft-skills (last visited April 16, 2013).
[27] *Id*.

likely to attend college, had lower body mass indexes, and proved better at maintaining relationships[28].

In a subsequent research by Celeste Kidd, Kidd posits that the children did not wait for the second marshmallow not because they could not exert proper self-control, but because they did not trust that the adult researcher would return as promised[29]. This lack of trust, Kidd argues, stems from the unchanging and uncertain home lives children face in underprivileged environments[30]. Testing her hypothesis, Kidd found that when priming the children to believe that the researcher was reliable or unreliable, those in the reliable researcher setting held out 65% of the time, whereas only *one* child in the unreliable researcher group waited the whole fifteen minutes[31].

Pairing Kidd's research with the findings of Dr Heckman, he notes that these non-cognitive skills, self-control and motivation, are developed early[32]. While adaption continues throughout our lives, many human abilities are formed in a predictable sequence of sensitive periods during which development of specific neural circuits and behaviors are most plastic and, therefore, optimally receptive to environmental influences[33]. Thus, the family environment is a major predictor of child ability, and notable disadvantage arises from lack of cognitive and non-cognitive stimulation given to

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[28] What Does the Marshmallow Test Actually Test?, BLOOMBERG BUSINESSWEEK: TECHNOLOGY, http://www.businessweek.com/articles/2012-10-17/what-does-the-marshmallow-test-actually-test (last visited April 16, 2013).
[29] *Id*.
[30] *Id*.
[31] *Id*.
[32] James J. Heckman, et. al., *Skill Formation and the Economics of Investing in Disadvantaged Children*, 312 AM. ACAD. OF SCIS., 1901, 1900-1906 (2006).
[33] *Id*.

young children[34]. Therefore, whether the Marshmallow Test properly gauges self-control formation or trust issues, it is apparent that early home environments promote crucial non-cognitive skills that lead to future life success.

V. SOCIOLOGICAL EVIDENCE

Dr Heckman highlights social programs that have generated significant success in boosting and supplementing early family environments both inside and outside the home. The Perry Preschool project is such a program. Enacted in Ypsilanti, Michigan, the project required weekly home visits with children who possessed subnormal intelligent quotients living in poor, underdeveloped neighborhoods[35]. Children were divided into a control group who attended preschool as normal in the Michigan community, and the program. The project focused on supporting a child's talents through active learning processes, engaging the community of teachers, administrators and family members in the lives of the preschoolers, and the development of intellectual maturity among the children[36]. Child participants would spend two and a half hours daily in classroom sessions on weekday mornings and have weekly ninety-minute home visits by the teachers on weekday afternoons[37]. The children were followed through longitudinal studies until they were forty years old. The project discovered that, when compared to the children in the control group, while many IQs remained fixed in the males, the females' intelligence quotas raised significantly. Personality and motivation of the participating children were enhanced leading to greater levels of socioeconomic

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[34] *Id*.
[35] James J. Heckman & Dimitriy V. Masterov, *The Productivity Argument for Investing in Young Children*, 29 REV. OF AGRIC. ECON., 457, 446-493 (2007).
[36] *Id*. at 478.
[37] *Id*.

achievement, lower incidents of teen pregnancy, lower likelihood of criminal behavior and jail time, and a decreased likelihood to require governmental assistance[38].

The Abecedarian program is another early education policy endorsed by Dr. Heckman. Providing full-time year-round classes for children from infancy through preschool, this project enrolled 111 children whose families scored high on the High Risk Index[39]. Enrollment in the program was based on the children's low incomes, inferior cognitive abilities, parental education levels, and high pathological behavior traits[40]. The children were randomly assigned into either a control group, who were enrolled in preschool as normal, and intervention group who were followed until the age of twenty-one. Every two weeks, homeschool teachers met with parents of the intervention group to help them establish additional learning activities in the home[41]. When assessed later in life, the children who participated in the Abecedarian program were found to have higher test and literacy scores than children in the control group[42]. Moreover, the participants exhibited less likelihood to engage in crime, and demonstrate higher rates of employment[43].

VII. REVOLUTIONARY RESULTS: CRIME & HEALTH

[38] Lex Borghans, Angela Lee Duckworth, James J. Heckman & Bas ter Weel, *The Economics and Psychology of Personality Traits*, INSTITUTE FOR THE STUDY OF LABOR, 2-164, 2 (2008).
[39] James J. Heckman & Dimitriy V. Masterov, *The Productivity Argument for Investing in Young Children*, 29 REV. OF AGRIC. ECON., 479, 446-493 (2007).
[40] *Id*.
[41] *Id*.
[42] *Id*. at 480.
[43] *Id*.

The United States currently spends over $1.3 trillion on crime[44]. It is undeniable that criminal activity is a grave social problem. Dr Heckman finds that one more year of schooling reduces the probability of incarceration by .37% for blacks and .1% for whites[45]. This reduced rate of incarceration is due to the increased rate of job attainment that is associated with continuing education[46]. Further, 23% of the black-white difference in average incarceration rates can be attributed to the education differences between these groups[47]. With incarceration rates steadily rising since the 1980s, application of the Heckman Equation will allow these statistics to finally reverse. By intervening in the lives of children who are at risk for social and economic failure – those living in single parent households, with parents who are poorly educated, living in impoverished neighborhoods – the Heckman Equation will effectively reroute their lives by instilling children with motivation skills to continue onto, and complete, high school. Heckman has found that completing high school raises a student's wage by about $10,372 per year[48]. When Dr Heckman examined the role of one's cognitive ability coupled with their attainment of higher education, he found that the rise in economic returns to education centers on those with high cognitive ability[49]. This means that if cognitive abilities, both soft skills and otherwise, are refined early, children are more likely to value their education and earn wages that reflect their significant academic abilities. Further,

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[44] *Id*. at 453.
[45] James J. Heckman & Dimitriy V. Masterov, *The Productivity Argument for Investing in Young Children*, 29 REV. OF AGRIC. ECON., 457, 446-493 (2007).
[46] *Id*.
[47] *Id*. at 458.
[48] *Id*.
[49] James Heckman & Edward Vytlacil, *Identifying the Role of Cognitive Ability in Explaining the Level of and Change in Returning to Schooling,* 83 THE REV. OF ECON. AND STATS., 6, 1-12 (2001).

low cognitive ability associated with failure to matriculate into secondary education heavily correlates with higher probability of incarceration[50]. Not only will these reforms boost the economy, they will preventatively cut the costs of criminal activity in areas such as law enforcement and prison.

Cigarette smoking is the leading cause of preventable death in the United States[51]. Obesity is number two[52]. Why are these *preventable* deaths still taking so many lives? The answer is simple: self-control and motivation. Dr Heckman argues that given the scientific research and knowledge available to us, we know what is contributing to our health problems. Heckman states, "We know exactly what the consequences to our actions are, we know what we are doing to ourselves and yet, we cannot stop ourselves![53]" He notes that personality factors influence cognitive ability. Patterns of thought, feelings and behavior all contribute to our abilities to internalize the messages of "right and wrong", "healthy and not" that we receive[54]. If we are able to train these otherwise persistent traits early by implementing the Heckman Equation instead of

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[50] James J. Heckman & Dimitriy V. Masterov, *The Productivity Argument for Investing in Young Children*, 29 REV. OF AGRIC. ECON., 469, 446-493 (2007).
[51] Adult Cigarette Smoking in the US: Current Estimate, CENTERS FOR DISEASE CONTROL AND PREVENTION, http://www.cdc.gov/tobacco/data_statistics/fact_sheets/adult_data/cig_smoking (last visited April 16, 2013).
[52] Obesity Related Statistics in America, GET AMERICA FIT FOUNDATION, http://www.getamericafit.org/statistics-obesity-in-america.html (last visited April 16, 2013).
[53] Heckman, *Heckman in Depth,* THE HECKMAN EQUATION http://www.heckmanequation.org/content/resource/heckman-depth (last visited April 16, 2013).
[54] Lex Borghans, Angela Lee Duckworth, James J. Heckman & Bas ter Weel, *The Economics and Psychology of Personality Traits*, INSTITUTE FOR THE STUDY OF LABOR, 3, 2-164 (2008).

remedial programs, society will appreciate a healthier, self-regulated, self-motivated world.

CONCLUSION

The Heckman Equation is simple, but its outcomes are complex. Early educational and environmental intervention initiates motivation becoming its own self-fulfilling prophecy and sustaining skills that will produce a successful, prolific society. Character matters. Personality is malleable. By targeting disadvantaged children and their families, we can impact the health and safety of society. Dr James Heckman's advice is proven to demonstrate high rates of economic return. All that remains is advocating for, and enacting, the policies to see this progress through. We are capable of more. Let's give America's youth a chance.