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THE LIMITS OF DOUBLE NEGATION IN ETHICS: A SHIFT TO CONTEXTUAL AND NON-CLASSICAL LOGICS

Osman Gazi Birgül*

ABSTRACT

The study aims at providing a logical analysis of the principles of practical ethics such as ‘The enemy of my enemy is my friend’ or ‘Peace is not the absence of conflict but the presence of justice’, which are often applied without deep analysis. To achieve this aim, the study is structured into two sections. The first section, arguing that these principles, though seemingly contradictory, share common logical grounds rooted in classical logic’s laws: double negation, the law of excluded middle, and the law of non-contradiction, explores the logical underpinnings of such ethical principles, analyzing their function within binary logical systems. Demonstrating that while these principles hold in binary contexts, the section argues that they struggle to accommodate the complexity of ethical scenarios where binary logic proves insufficient. Accordingly, double negation, crucial in dichotomous predicates, falters in situations involving vagueness or moral nuance, where non-classical logics like fuzzy or intuitionistic logic offer more flexibility. The second section argues that classical binary logic fails to capture the gradations of moral reasoning, exemplified by dilemmas like the Trolley Problem, and that virtue ethics, which emphasizes context and practice, aligns better with these alternative logical systems. The study concludes that a shift to non-classical logics is necessary to address the complexities of ethical reasoning, highlighting the inseparability of moral theory and practice.

Keywords: Double Negation, Practical Ethics, Binary Logics, Many-Valued Logics, Virtue Ethics

* Dr., Manisa Celal Bayar University, gazibirgul@gmail.com, ORCID: 0000-0003-2089-848X

ETİKTE ÇİFT OLUMSUZLAMANIN SINIRLILIKLARI: KLASİK-OLMAYAN VE BAĞLAMSAK MANTIKLARIN GEREKİLİLİĞİ

ÖZ

Bu çalışma, günlük hayatta sıklıkla ve derinlemesine bir analiz yapılmadan uygulanan ‘Düşmanın düşmanı dostumdur’ veya ‘Barış, çatışmanın yokluğu değil, adaletin varlığıdır’ gibi pratik etik ilkelerinin mantıksal bir analizini yapmayı amaçlamaktadır. Bu amacı gerçekleştirmek için çalışma, iki ana bölümde yapılandırılmıştır. İlk bölüm, bu ilkelerin görünüşte çelişkili olmalarına rağmen, klasik mantığın üç temel yasasına—çift olumsuzlama, üçüncü değerin olanaksızlığı ve çelişmezlik yasası—dayanan ortak mantıksal temelleri paylaştığını ileri sürmektedir. Bu bölümde, söz konusu ilkelerin iki-değerli mantık sistemlerinde nasıl işlediği açıklanmakta ve iki-değerli mantığın etik bağlamlardaki karmaşıklığı açıklamada yetersiz kaldığı savunulmaktadır. Bu bağlamda, çift olumsuzlama her ne kadar ikili yüklemelerde önemli bir işlevi görse de klasik mantık belirsizlik veya ahlaki nüans içeren durumlarla başa çıkmada yetersiz kalmaktadır. İki-değerli klasik mantık ile kıyaslandığında, bulanık mantık veya sezgici mantık gibi klasik olmayan mantık sistemleri daha uygun çözümler sunmaktadır. İkinci bölüm, klasik iki-değerli mantığın ahlaki akıl yürütmenin derecelerini ve ahlaki nüansları doğru şekilde modelleyemediği savunmakta ve bunu Tramvay Problemi gibi ikilemlerle açıklamaktadır. Ayrıca, bağlama ve pratiğe odaklanan erdem etiği anlayışının, bu alternatif mantık sistemleriyle daha uyumlu olduğunu vurgulamaktadır. Çalışma, etik akıl yürütmenin karmaşıklıklarını ele almak için klasik olmayan mantıkların temel alınmasını ve ahlaki teori ile pratiğin birbirinden ayrılmaz olduğu sonuçlarına varmaktadır.

Anahtar Sözcükler: Çift Olumsuzlama, Pratik Etik, İki-Değerli Mantıklar, Çok-Değerli Mantıklar, Erdem Etiği

1. INTRODUCTION

There are some principles in practical ethics that are applied in everyday practice without much analysis. To demonstrate, ‘The enemy of my enemy is my friend’, ‘the weakness of my enemy is my strength’, ‘cheat the cheater’ are some examples. Some of such principles are proverbs and some are clichés that are no less known than such proverbs. Unsurprisingly, there are some other ethical principles promoting contrary codes: ‘Peace is not the absence of conflict but the presence of justice’, or ‘Being against evil does not make you good’. In spite of their differences, when scrutinized, it is possible to analyze their structure and lay out their common and fundamental grounds. This paper aims at making such an analysis of these grounds mainly by focusing on their logical aspects. In that regard, the paper presents an analysis of the principles listed above and explains their relation to normative ethics based on the type of logic appealed in such and similar cases.

To introduce the basic logical terminology to the unfamiliar reader, these principles are based on an interplay among three well-known laws of logic, which are double negation, the law of excluded middle (abbreviated as LEM), and the law of non-contradiction (abbreviated as LNC). In simple terms, double negation is the assertion that ‘Any proposition is logically equivalent of the negation of its negation’. To illustrate, ‘It is raining’ is the logical equivalent of ‘It is not the case that it is not raining’. The LEM asserts that ‘Every proposition is true or false, and there is no third truth-value’. According to the LEM, the proposition ‘The light is on’ must be either true or false, there is no third option that can be taken as a truth value. The LNC asserts that ‘No proposition is simultaneously true and false’, thus not allowing such propositions as ‘The light is on’ to be simultaneously true and false because it is contradictory to affirm that the light is both on and not on.

The interplay of these three laws has valid applications in strictly binary logical systems where there are only two truth values as true and false. When one shifts from strictly binary logical systems to many-valued logics that allow more than two truth values by some additional values. For example, *unknown* as in ternary logics, undecided (meaning lack of proof) as in intuitionistic logics, or *both* (meaning contradictory information) and *neither* (meaning lack of information) as in Belnap’s four-valued logics. As is known, when the value-based system is shifted, these three laws of strictly binary systems either do not hold or do not behave the way they do in strictly binary systems. The first aim of the present study is to show that the principles of practical ethics listed above rely on the interplay among these three laws of logic and they seem to hold in strictly binary ethical systems. The second aim is to show that ethical contexts are complex contexts and there are many cases where binary ethical systems cannot explain while different and many-valued logical systems can.

To achieve these aims, this study is structured into two sections. The first section presents a detailed analysis of double negation and its function across various logical systems. The analysis begins with binary systems and dichotomous predicates. It is argued that double negation is strictly applicable to dichotomous predicates (e.g., even/odd) in classical binary logic. Its function relies on the LNC and the LEM, and the argument is supported by examples involving dichotomous predicates. Then the section challenges the strictly binary systems by examples that involve vagueness. It is argued that double negation struggles with vague predicates, where boundaries are unclear, further proposing that the solution may lie in adopting many-valued logics like fuzzy logic, which can better accommodate degrees of truth.

The first section further elaborates on many-valued logics and introduces intuitionistic logic, claiming that in systems like intuitionistic logic, double negation does not function as it does traditionally. This claim is

supported by the examples from intuitionistic logic and their ethical counterparts. To challenge the applicability of double negation further, the section discusses some cases within the framework of deontic logic, which deal with permissions, obligations, and prohibitions. It is argued that while classical deontic logic accommodates double negation in some cases, others require non-classical approaches (e.g., fuzzy or intuitionistic deontic logics) to resolve ethical dilemmas.

The second section explores the limitations of double negation in ethical contexts, contrasting classical logic with the complexity of moral reasoning. The section argues that Aristotle's laws of classical logic, the LNC and the LEM, affirm that contradictory properties cannot coexist, making double negation straightforward in logical contexts. However, Aristotle's distinction between conditional and unconditional predicates highlights that ethics often operates in conditional terms, complicating the application of double negation. The second section introduces nuanced contexts, like the Trolley Problem, where classical logic's binary framework (moral/immoral) fails to capture gradations or justified exceptions, necessitating non-classical logics. Examples like 'the enemy of my enemy is my friend' and 'peace is not the absence of conflict but the presence of justice' illustrate cases where ethical categories require context-sensitive analysis rather than dichotomous classification. The second section text argues for the inseparability of moral knowledge and practice, as emphasized in virtue ethics, and supports the argument by the principle of virtue ethics, i.e., virtues are cultivated through practice, not innate or merely intellectual. Logical explanations (e.g., negating evil) must be complemented by practical actions that construct positive moral outcomes. Thus, ethical reasoning aligns more with intuitionist logic, rejecting the LEM and emphasizing constructive moral practices over binary negations.

The first conclusion of the study is that while double negation is foundational in classical binary logic, its limitations in handling vagueness, many-valued contexts, and certain ethical scenarios demonstrate the need for alternative logical systems. The second conclusion is that there is need for the integration of non-classical logics and virtue ethics to address the complexities of ethical reasoning, which move beyond the limitations of classical logic and double negation.

2. Double Negation in Logical and Ethical Contexts

The first point regarding double negation is that it is applicable only to dichotomous predicates within the context of binary logical systems. *On* and *off*, *open* and *closed*, *full* and *empty*, *even* and *odd* are some examples of dichotomous predicates, where there is no intermediary quality or predicate between any two of them. Some might have reservations regarding whether a door that is not shut is half-closed or half open, or similarly whether a glass might be half-full or half-empty without necessarily being completely full or

empty. Within the context of strictly binary systems, there is no room for perspective-dependent interpretations. There is also no room for framing effect, which refers to how observers interpret the same information differently depending on how the information is presented to them, as in the pessimist and optimist framings of the half-full or half-empty glass. If it still seems otherwise, consider the predicates even and odd, where no whole number can be predicated of half-even or half-odd. The reason lies in the relations of double negation to the LNC and to the LEM.

Recall that the LNC asserts that no proposition can be true and false simultaneously, and the LEM asserts that all propositions are either true or false and there is no third truth-value. The binary character of the classical logic relies on the LEM, and on this ground, double negation functions in accordance with the LNC in the case of dichotomous predicates. Aristotle and Frege support the point, while Aristotle formulates the LNC, which underpins the validity of double negation in binary systems (1998, p. 1006a),¹ Frege lays foundations for neo-classical binary logical systems, which build upon classical logic in light of the issues in logic and philosophy in 1879.² To demonstrate the point, take the proposition (P), meaning that ‘The door is closed’. By the LEM, (P) is either true or false. Let us assume that (P) is true. Then, its negation, ($\neg$ P) must be false, as one cannot assign truth and falsity to the same proposition by the LNC. In this case the double negation of (P), $\neg(\neg$ P), would assert that ‘It is not the case that the door is not closed’, which would boil into (P), that ‘The door is closed’. The function of double negation can be observed in the case of assigning falsity to (P), where its negation gets true as its truth value: ($\neg$ P) is true. When ($\neg$ P) is negated, one gets $\neg(\neg$ P), i.e., ‘It is not the case that the door is not closed’ is false. When ($\neg$ P) is double negated, $\neg\neg(\neg$ P), by the LNC and the LEM, one restores the original proposition ($\neg$ P) that is assigned to true, i.e., it is the case that ‘The door is not closed’.

Although the explanation of how double negation functions in classical logic in relation to the LNC and LEM, there still seems to be a caveat in order, that is, predicating a door either closed or open and ignoring the intermediary cases and framing effect may seem counterintuitive. Unlike such strictly bipolar and binary cases as even and odd, we are inclined to consider the predicates closed, open, full and empty as scalar predicates, which describe properties or qualities that can be measured along a continuum or a scale,

¹ To facilitate reader’s ability to track the quotes, I use Greek paginations for the quotes from Aristotle.

² See, Frege, G. (1967). “Concept Script: A Formulation of Pure Thought Modelled on That of Arithmetic.” Trans. John N. Crossley and John van Heijenoort. From Frege to Gödel: A Source Book in Mathematical Logic, 1879–1931, edited by Jean van Heijenoort, Harvard University Press, pp. 1-62.

rather than the binary all-or-nothing manner. The reason why we are inclined to consider these predicates scalar shares the same rationale of Zeno's paradoxes: one can grade a finite quantity infinitely or finitely. As in Zeno's paradoxes, one can divide a finite length into infinitely many parts because between two whole numbers there are infinitely many real numbers. Thus, theoretically speaking, it is possible to consider the door's being open as scalar and divide the distance between the door and the door frame into infinitely many small distances. This theoretical aspect relies on the same rationale as Zeno's paradoxes do. Yet, practically speaking, measurement requires definitely many pieces, wherein inches, centimeters, etc., are involved. It is due to the practical aspect of measurements that we are inclined to consider a glass to be x percent full and y percent empty. However, adding scalar predicates to a strictly binary system of classic logic would be costly, that is, it requires one to exclude the LEM out of the system, which would eventually end the consistent functioning of double negation.

The second point regarding double negation is that its rigid application to vague predicates and concepts poses serious challenges for the classical logic in dealing with imprecision. Vague predicates lack a precise or clear boundary in their application, meaning they do not have a definitive cutoff point that dictates when they apply. Examples include heap as in sorites paradox, young, tall and similar predicates where there is no definitive and precise boundary regarding the intension of their definition. Quine, arguing that it is difficult to propose an all-purpose resolution of vagueness, discusses how a term in its general and singular uses demonstrate vagueness. According to him, a singular term can be vague "in point of the boundaries of that object in space-time, while a general term can be vague in point of the marginal hangers-on of its extension" (Quine, 2013, p. 114). The case is 'mountain' as a general term, which is "is vague on the score of how much terrain to reckon into each of the indisputable mountains" (Quine, 2013, p. 114), and it is vague as a singular term because even if "we take to treating the mountain as a point, the summit" (Quine, 2013, p. 115), "it is not clear when to declare a saddle to be in the middle of one mountain and when between two mountains. The issue makes all the difference between one mountain and two" (Quine, 2013, p. 114). When evaluated in the context of double negation, discussing height with respect to the predicate 'mountain', there may be complexities in the application of this predicate, especially if the height is marginally above or below the threshold one might set for classifying something as a mountain, let alone its dependence on the classification of geographical features like saddles. Ultimately, this vagueness exposes the inadequacy of double negation in capturing the fluidity of such terms, revealing that rigid logical structures struggle to accommodate the nuanced realities of language and meaning. I think that despite it is difficult to propose an all-purpose solution for the resolution of vagueness by linguistic analysis, it is easy to propose such a

solution by a shift from classical logic to many-valued logics. Such a solution can be found in fuzzy logic, which is designed to handle concepts that are vague or have degrees, where double negation does not reduce to clear-cut binary opposites, rather yields ambiguous cases, where the truth of the statement remains uncertain or context-dependent (Bara & Goss, 1988; Zadeh, 1965 and 1996).

The third point to be noted is that double negation functions properly in strictly binary logical systems. In many-valued systems, double negation fails to function. One such system is the intuitionistic logic, wherein Brouwer and his follower Heyting made strong objections against double negation.³ As is known, Brouwer is the founder of intuitionism in philosophy of mathematics and his philosophical perspective required logicians and mathematicians to develop constructive proofs for the mathematical objects if they are to be allowed in the ontology of mathematics at all. Brouwer's criticisms target the LEM, which is closely related to double negation. Unlike classical logic and mathematics, intuitionistic logic and mathematics is not satisfied with *reductio ad absurdum* proofs where the LEM plays a key role. Instead, intuitionistic logic requires the demonstration of the stepwise construction of the mathematical entity. Brouwer, criticizing the LEM and double negation, discusses numerous cases such as function theory, infinite sequences of numbers and numbers with infinite sequences (e.g. π) in several papers.⁴ The key idea defended by Brouwer is that by the LEM and through a *reductio ad absurdum* proof one cannot infer P from $\neg(\neg P)$, rather one needs a constructive proof.⁵

³ Heyting, A. (1930). *Die formalen Regeln der intuitionistischen Mathematik II*, Sitzber. Berlin: Preuss. Akad. Wiss. (phys.-math. Klasse), pp. 57-71.

⁴ See, Brouwer, L. E. J. (1948a). "Essentieel-Negatieve Eigenschappen." Koninklijke Nederlandsche Akademie van wetenschappen. Proceedings of the section of sciences, 51, pp. 963-964; (1948b). "Opmerkingen Over Het Beginsel Van Het Uitgesloten Derde En Over Negatieve Asserties." Koninklijke Nederlandsche Akademie van wetenschappen. Proceedings of the section of sciences, 51, pp. 1239-1243; (1949). "De Non-Aequivalentie Van De Constructieve En De Negatieve Orderrelatie In Het Continuum." Koninklijke Nederlandsche Akademie van wetenschappen. Proceedings of the section of sciences, 52, pp. 122-124; (1950). "Remarques Sur La Notion D'ordre." Comptes rendus hebdomadaires des séances de l'Académie des sciences, 230, pp. 263-265; (1951). "On Order In The Continuum, And The Relation Of Truth To Non-Contradictority." Koninklijke Nederlandsche Akademie van wetenschappen. Proceedings of the section of sciences, 54, pp. 357-358.

⁵ As expected, the constructive proofs are mathematical performative, i.e., they require one to perform the mathematical construction of the proof and thus the mathematical object in question. The performative aspect of ethical knowledge is analogous to the constructive proofs, which is discussed in the following section.

Following Brouwer, Heyting objects the LEM, which is the functional ground of double negation in strictly binary systems. Heyting contends that the existence of mathematical objects “is guaranteed only insofar as they can be determined by thought. They have properties only insofar as these can be discerned in them by thought. But this possibility of knowledge is revealed to us only by the act of knowing itself” (Heyting, 1983, p. 53).⁶ The demand for constructive proofs targets the LEM as well as double negation. Consider the example that ‘Goldbach’s conjecture is true’ (P) and ‘Goldbach’s conjecture is false’ ($\neg P$). by double negation, the assertion ‘It is not the case that Goldbach’s conjecture is false’ $\neg(\neg P)$ seems to be logically equivalent to ‘Goldbach’s conjecture is true’ (P). Yet, both Brouwer’s and Heyting’s objections to double negation require one to step out of the strictly binary logical ground of the LEM, where there is a third alternative: making constructive proofs. This implies that double negation functions in strictly binary systems, however, when one appeals to double negation in ternary or many-valued systems, it becomes inevitable to conclude that $\neg(\neg P)$ simply asserts that (P) cannot be false in a binary system and this assertion is not the same thing as showing the truth of (P) constructively.

The fourth and last point about double negation concerns the applicability of double negation in deontic logics. As is known deontic logic is the formal study of permissions, obligations and prohibitions in the framework of deontic logical systems.^{7, 8} While in some of them, e.g., classical deontic logic or temporal deontic logic, double negation functions under certain circumstances, there are other types where the ethical issues that cannot be overcome by classical deontic logic are resolved by other logical instruments or different logical perspectives such as fuzzy deontic logic or intuitionistic deontic logic. I think some examples demonstrate the point that double negation is not a necessary logical law that is applicable to all circumstances, thus paving the way for the other types of logics to explain away the dilemmas that double negation cannot.

⁶ Note that similar to Brouwer, Heyting as well underscores the significance of performative aspect of the constructive proofs, which has ethical implications as shall be seen in the following section.

⁷ Foot, P. (1967). “The Problem Of Abortion And The Doctrine Of Double Effect.” *Oxford Review*, 5, pp. 5–15, and Hilpinen, R. (Ed.). (1971). *Deontic Logic: Introductory and Systematic Readings*. D. Reidel Publishing Company.

⁸ For the formalization of laws as an application of deontic logics see Royakkers, L. M. M. (1998). *Extending Deontic Logic for the Formalisation of Legal Rules*. Springer.; and for some introductory reading including the historical background of deontic logics see Gabbay, D., Horty, J., Parent, X., van der Meyden, R., & van der Torre, L. (Eds.). (2013). *Handbook of Deontic Logic and Normative Systems*. College Publications.

For brevity, let me discuss case (1) which can be resolved by classical deontic logic, and another case (2) that cannot be done so by classical deontic logic, and case (3) to show that such cases can be resolved by non-classical deontic logics such as fuzzy deontic logic. The case (1) is the proposition ‘It is obligatory that a task is completed’. The primary operator O stands for ‘it is obligatory’, and P is the symbol for the proposition ‘Task is completed’. Thus, $O(P)$: ‘It is obligatory that the task is completed’. When double negated, $O(P)$ turns into $\neg O(\neg P)$: ‘It is obligatory that it is not obligatory not to complete the task’. In classical deontic logic, if $O(P)$ holds, so does $\neg O(\neg P)$ because the negation of an obligation to not do the task ($\neg O(\neg P)$) implies the original obligation to do it ($O(P)$), that is by double negation there is biconditional implication between these two propositions: $\neg O(\neg P) \Leftrightarrow O(P)$.

On the other hand, there are other cases which cannot be handled by an appeal to double negation within the framework of classical deontic logic. Case (2), ‘It is not obligatory to prohibit lying’ demonstrates the point. Let L represent the proposition ‘Lying is permitted’ and let $O(\neg L)$ represent the proposition ‘It is obligatory not to lie’. When $O(\neg L)$ is negated, i.e., $\neg O(\neg L)$ means ‘It is not obligatory to prohibit lying’, as the proposition $O(\neg L)$ can be paraphrased as ‘Lying is prohibited’. In case (2), ‘It is not obligatory to prohibit lying’ leaves open the possibility that lying is allowed but not required to be prohibited. When one double negates $\neg O(\neg L)$, one cannot derive $O(L)$ because the proposition ‘It is not obligatory to prohibit lying’ does not imply $O(L)$, namely the permissibility of lying in the form of ‘It is obligatory to lie’. The reason is, in classical deontic logic the absence of an obligation cannot capture the permissibility of lying because as in all classical logics, classical deontic logic treats obligation and non-obligation as dichotomous predicates. While $\neg O(\neg L)$ only asserts that lying is not obligatorily prohibited, it does not assert anything regarding whether lying is explicitly permitted, obligatory, or neutral. Due to the non-dichotomous nature of the possible outcomes, such as permission where lying is allowed but not required, neutrality where there is no obligation or permission of lying, and prohibition where lying is forbidden.

Case (2) steers the direction of the debate to non-classical logics, where it is possible to model the non-dichotomous aspect of permission, neutrality, and prohibition. Before discussing case (3), let me note that classical deontic logic treats the grade of membership dichotomously, i.e., “grade of membership in the set is either [0], FALSE, not in the set, or [1], TRUE, in the set” (Peckol, 2015, p. 68). When compared, fuzzy deontic logic appeals to fuzzy sets to express the degrees of truth instead of treating truth and falsity as binary values but as degreed or graded where “the degree of membership in a subset by allowing any membership value (and gradual

transition) between $[0.0, 1.0]$ " (Peckol, 2015, p. 68).⁹ That is, in fuzzy deontic logic, the obligation to prohibit lying can be represented as a fuzzy membership function where the degree of obligation ranges from 0 to 1, where 0 stands for 'not obligatory' while 1 stands for 'obligatory'. To make the point, let me discuss case (3), i.e., the proposition 'It is not obligatory to prohibit lying'. Let $O(\neg L)$ represent the degree to which it is obligatory not to lie (i.e., the degree that lying is prohibited) and let $P(L)$ represent the degree to which lying is permitted. The negation of $O(\neg L)$, i.e., $\neg O(\neg L)$, means 'It is not obligatory to prohibit lying'. If the degree of obligation to prohibit lying is low, e.g. 0.2, in fuzzy terms $O(\neg L)$ can be expressed as $O(\neg L) = 0.2$, meaning that there is a weak obligation not to allow lying. However, unlike classical deontic logic, the weak obligation not to allow lying does not rule out the possibility that lying may still be permissible to a certain degree, which makes the degree of permissibility of lying 0.8, i.e. $P(L) = 0.8$. Recalling the examples given above such as a door that is half-open and half-closed, or a glass that is half-full or half-empty, it is evident that the ethical cases that are not addressed by classical logic are provided with nuanced interpretation through fuzzy logic. Similarly, unlike classical deontic logic, such ethical cases as (3) are provided with nuanced interpretation in fuzzy deontic logic where obligation, permissibility, and neutrality are not treated as dichotomous but degreed.

3. Double Negation, Epistemology of Virtue Ethics, and Practicality

As is mentioned above, double negation is closely related with two laws of classical logic, namely, the LNC and the LEM. In his *Metaphysics*, Aristotle contends that "if it is impossible both to assert and to deny truly at the same time, then it is also impossible for opposite properties to pertain simultaneously, unless the two properties pertain in different ways or one qualifiedly and the other *simpliciter*" (1998, p. 1011b). Elsewhere in *Metaphysics*, Aristotle asserts that it "is impossible for the same thing at the same time both to be-in and not to be-in the same thing in the same respect" (1998, p. 1005b). When scrutinized, by asserting that it is impossible for opposite properties to pertain simultaneously, Aristotle appeals to both the LNC and the LEM. Opposite properties cannot pertain to a thing simultaneously because, by the LNC, it would result in a contradiction. To avoid contradiction, one needs to rely on the principle that a property cannot be affirmed and negated for the same thing in the same respect, which is a core principle of classical logic.

To show its relevance to double negation, let me break down the quote and discuss it in an ethical context. Firstly, note that Aristotle adds an

⁹ For a detailed and more technical explanation, see Buckley, J. J. & Eslami, E. (2002). *Advances in Soft Computing: An Introduction to Fuzzy Logic and Fuzzy Sets*. Springer, pp. 21-23.

exceptional condition for the LNC: unless the two properties pertain in different ways or one qualifiedly and the other *simpliciter*. Here, ‘qualifiedly’ means conditional affirmation of a predicate while ‘simpliciter’ means an unconditional one. To demonstrate, one is qualifiedly honest when one is honest in some circumstances and not in others. On the other hand, one is honest simpliciter if one is honest in all circumstances. Double negation states that negating a negation brings one to the original proposition. Take ‘lying’ as P, then ‘not lying’ is $\neg P$, and by double negation, ‘not not-lying’ becomes $\neg(\neg P)$, which equals P, or ‘lying’. Unlike this logical and strictly binary formulation which relies on abstract realm where qualities are predicated simpliciter, the ethical realm involves complex structures consisting of context, intention, moral judgment, etc. This means that rather than simpliciter, the ethical properties are mostly predicated in a way that Aristotle coins ‘qualifiedly’. Due to this reason, in the ethical realm, saying that one is ‘not not-lying’ ($\neg(\neg P)$) could mean that one might lie under certain circumstances such as saving someone else’s life, thus not necessarily doing something immoral either. Unlike the logical and abstract realm where, by the LNC and the LEM, lying cannot be moral and immoral simultaneously or there is no third moral value that lying can take other than being moral and immoral, ethical realm often involves contexts where lying can be justified, where double negation does not simply restore the original or the simpliciter moral value of lying. The complexity of the ethical contexts requires one to appeal to non-classical logics to find explanations for the cases such as ‘the enemy of my enemy is my friend’, ‘the weakness of my enemy is my strength’, or ‘peace is not the absence of conflict but the presence of justice’, or ‘being against evil does not make you good’.¹⁰

The analysis of these complex ethical contexts that I present below is based upon the four points that I made in the first section. Thus, to provide a clearer and more concise analysis let me first recapitulate the points made in the first section. Recall that the points are (1) double negation is functional for the dichotomous predicates and within classical logics, (2) double negation cannot provide a ground to explain vague or graded predicates, (3) when evaluated from the perspective of the intuitionistic logic, double negation of a predicate does not imply its affirmation due to the objections of the intuitionists against the LEM, and (4) as there are cases which cannot be resolved by double negation within the sphere of classical deontic logics, non-classical deontic logics provide better analyses of such unresolvable cases.

¹⁰ The introduction of Aristotle’s classical logic within an ethical context might sound as if Aristotle argued for sticking to classical logic in his ethics. Yet, as is discussed below, Aristotle is the founder of virtue ethics and despite classical logic is insufficient for the analysis of complex ethical contexts, he does not build his virtue ethics on classical logic but on habituation, a view still defended by many philosophers.

When scrutinized, these points serve as a ground for the following arguments: due to their complex nature, (a) logically the ethical contexts should be analyzed in light of non-classical logics, and (b) epistemologically these cases must involve practicality in addition to the know-how and know-that of ethical codes.

To start with (a), pragmatics of double negation indicates that the meaning of negation is a context-dependent varying from one ethical context to another. Due to the ambiguity of the predicates such as enemy, good person, and as such, one needs to work on exclusively classical contexts where something is ethically and necessarily categorized dichotomously, which is not realistic and ethically sound in this world. Take the famous dilemma called *Trolley Problem* as an example,¹¹ where it is possible to interpret the conflicting duties differently from classical deontic logic. Let $O(a)$: ‘It is obligatory to save five people by diverting the trolley’. And let $O(\neg a)$ stand for ‘It is obligatory not to actively cause harm to single person’. When the duty not to act is negated, i.e., $\neg O(\neg a)$, it means it is not obligatory to refrain from pulling the lever, which does not necessarily imply that it is obligatory to carry out $O(a)$ but it simply suggests that inaction is permissible. The example shows that there is not always a two-horned dilemma as classical logic would impose, there is another third option as inaction. Such many-valued cases are analyzed better in non-classical logics. For example, let $O(p)$ mean ‘it is obligatory to do p’, let $F(p)$ mean ‘it is forbidden to do p’, and let $P(p)$ mean ‘it is permissible to do p’. Obviously, $\neg F(p)$ does not necessarily imply $O(p)$ because double negation does not behave as it does in classical logic. To sharpen the point, consider the tautology $O(p) \vee F(p)$, which turns into $\neg O(p) \wedge \neg F(p)$ by De Morgan, which results in $P(p)$ that is neither logical equivalent of $O(p)$ nor $F(p)$. When these considerations are applied to the cases ‘the enemy of my enemy is my friend’ and ‘the weakness of my enemy is my strength’, it gets clear that the enemy of my enemy is not necessarily my friend. Similarly, my strength does not necessarily consist in the weakness of my enemy because there are third or other ethical alternatives that are inaccessible by an appeal to double negation and by staying within classical logic.

Coming to (b), namely the argument that epistemologically ethical cases must involve practicality in addition to the know-how and know-that of ethical codes, the argument expounds more on the clues for where to look for the answers to such questions as what the enemy of my enemy is to me, what

¹¹ Foot, P. (1967). “The Problem Of Abortion And The Doctrine Of Double Effect.” *Oxford Review*, 5, pp. 5–15; and Thomson, J. J. (1976). “Killing, letting die, and the trolley problem.” *The Monist*, 59(2), pp. 204–217.

my strength consists of. The aphorisms ‘peace is not the absence of conflict but the presence of justice’ and ‘being against evil does not make you good’ imply that, on the ground of intuitionistic logic, there is need for practicality to account for answers to such questions. In other words, logic provides a negative explanation while epistemology provides a positive one. Logic explains why one should not assume the opposite of the negated negative categories such as enemy, or evil by appealing to double negation, epistemology provides ground for the essence¹² of third and other ethical alternatives on the basis of the notion practicality.

The rationale of the point relies on the epistemic inseparability of moral knowledge and its practice. As is known, this is the core rationale of virtue ethics. The basic question of virtue ethics is the question of what it means to live an ethical life. Aristotle provides an answer to this question by his concept of *habituation*, according to which “virtues arise in us neither by nature nor contrary to nature, but nature gives us the capacity to acquire them, and completion comes through habituation” (2004, p. 1103a), meaning that “we acquire [virtues] by first exercising them” (2004, p. 1103a). Aristotle argues that the knowledge of a virtue is inseparable from its practice. We are not virtuous or evil by nature, but by the measure of whether the virtues find room for themselves in our practices. Although Aristotle is the founding father of classical logic laying its foundational framework, note that his ethics does not allow one *not evil*, i.e., not not good person, to be interpreted as a good one. Instead, he claims that “we become just by doing just actions, temperate by temperate actions, and courageous by courageous actions” (Aristotle, 2004, p. 1103b).

As expected, Aristotle’s rationale for virtue ethics has its echoes in various ethical contexts and contemporary views on ethics. For example, inspired by Aristotle, Anscombe criticizes contemporary moral theories and argues for a return to virtue ethics, where the ethical knowledge cannot be detached from practice (1958). Westphal emphasizes the epistemic inseparability of orthodoxy and orthopraxy in the context of religious virtue ethics, arguing that knowing is not just “to know how, but also that to know is to do” (1990, p. 107). That is, religious knowledge, being practical, assumes a non-descriptive and moral character, setting it apart from Ryle’s conceptualizations of *know-how* and *know-that*.¹³ Expounding on how moral knowledge diverges from Ryle’s *know-how* and *know-that*, Tang contends

¹² The use of essence may sound like as if I assume some Platonic source of normativity in ethics, yet that is not the case. The reason is such an assumption would imply that there is only one true way of acting in each ethical case. As I have made it clear that ethical contexts are inexhaustibly complex, I will contend myself by stating that there is no Platonic assumption behind the word ‘essence’.

¹³ Ryle, G. (1949). *The Conception of Mind*. Hutchinson.

that it does not diverge from know-that by revolving around the knowledge of precepts and it does not diverge from know-how by being centered on the ability to execute specific procedures; instead, the divergence pertains to the disposition¹⁴ to do what is right (2011, p. 437).

I think the inseparability of ethical knowledge and practice proves the approaches of Heyting and Brouwer against the LEM. In other words, double negation does not efficiently function in the analysis of the initial aphorisms. For example, the enemy of my enemy is not and cannot be my friend, unless there is positive and constructive practice whereby one builds up friendship. Or consider 'Peace is not the absence of conflict but the presence of justice'. This proposition is epistemologically based on virtue ethics and logically on intuitionist logic. The reason is, from the epistemological aspect presence of justice cannot be detached from the practice of justice and logically absence of conflict does not imply the presence of peace. Finally, 'Being against evil does not make you good' serves as an example where practice of virtues and being a good moral agent cannot be logically grounded on the negation of evil, on the contrary it requires the construction of good acts, which correspond to practice within the context of virtue ethics.

4. CONCLUSION

The analyses above indicate that double negation is applicable to dichotomous predicates and functions together with the LNC and the LEM in strictly binary systems, yet these systems do not provide an analysis of the predicates in complex ethical contexts. Double negation's incapability of accounting for the vague predicates or graded predicates in such complex contexts shows that one needs to appeal to non-classical many-valued logics. An example for such logics is the fuzzy deontic logic, whereby it is possible to provide more comprehensive and precise analyses of such graded predicates as well as the realistic cases from complex ethical contexts. However, appealing to non-classical and many-valued logics does not resolve such cases but only provides in-depth analyses. There is also need for an explanation of practical and constructive aspects of building relationships such as friendship. The reason is, double negation and the LEM do not explain why one should affirm the opposite of a negated or a double negated predicate as in the case of assuming the enemy of one's enemy as one's friend. This drawback can be epistemologically compensated by an appeal to virtue ethics, in which ethical

¹⁴ There are extensive debates about the motives and the conditions of moral practices. Tang evaluates them from the perspective of moral psychology while others such as Annas (2011) and MacIntyre (2007) defend that moral dispositions are developed within the context of practices. Yet, the epistemic inseparability of virtues and their practice still remains as the core rationale. See Annas, J. (2011). *Intelligent Virtue*. Oxford University Press, and MacIntyre, A. (2007). *After Virtue: A Study in Moral Theory*. University of Notre Dame Press.

knowledge is inseparable from the practice of virtues. It is on the grounds of virtue ethics that one can explain why peace is not simply the absence of conflict, or being against evil does not make one good. In conclusion, such bipolar cases imposed by aphorisms or proverbs have classical logic in the background. Instead of relying on strictly binary ethical systems, many-valued logics and virtue ethics should be appealed not only for resolving these cases but also compensating for the logical and epistemological shortcomings of the strictly binary ethical frames.

CONFLICT OF INTEREST

The author declares no conflicts of interest.

ETHICS COMMITTEE APPROVAL / PARTICIPANT CONSENT

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